REMARKS

Claims 1-20 are pending in the present application, and are rejected. Claims 1-3 and 13-17 are herein amended. Claims 4-12 and 18-20 are canceled. New claims 21-32 are added herein.

Claim Rejections - 35 U.S.C. §112, first paragraph

Claims 1-6 and 16-18 are rejected under 35 U.S.C. §112, first paragraph, because the specification, while being enabling for a range of pore diameters from 5 microns to 100 microns, does not reasonably provide enablement for a diameter of "5 microns or greater".

Applicants herein amend the claims to change the phrase "~~or greater~~" to "to 100 μm". Applicants further amend claims 7-15 to recite a maximum stated diameter, rather than a value of "X μm *or less*".

The Examiner notes that claims 7-9 and 19 recite a range within a range. Applicants herein amend these claims to reflect a definite range. Applicants submit that the above rejections have been fully addressed by the present amendments.

Claim Rejections under 35 U.S.C. §102(b) and §103(a)

Claims 1-16 and 18-20 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,453,333 to Takauchi et al.

Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over Takauchi et al. in view of U.S. Patent No. 5,681,357 to Eschbach et al. The Examiner concludes that it would have been obvious to modify the teachings of Takeuchi et al. by providing a PVDF on the sides

of the separator since it would have aided in the absorption of the electrolyte in the separator and upon "gelling", improved the adhesion between the separator and electrodes.

Applicants herein amend claims 1 and xxxx. Subsequently, Applicants respectfully disagree with the rejection, because not all of the claimed limitations are taught or suggested by the cited references.

Applicants note that Takauchi et al. appears to teach the inclusion of a porous membrane that comprises pores, wherein the membrane permits the flow of ions at a lower temperature, but which pores close sufficiently to block the flow of current at a higher temperature. The membrane is not intended to allow the passage of dendrites. In fact, the reference indicates that the size of the pores must be carefully selected to avoid the formation and passage of dendrites therethrough (col. 10, lines 24-26). However, Applicants note that the reference teaches that the size of the pores may be as large as 10 μm to perform its intended function. Applicants note that this size is inside the range of pore sizes taught by the present invention, which claims a pore diameter of 5 μm to 100 μm.

Therefore, Applicants herein amend the claims to limit the size of the through holes to a diameter larger than that disclosed by the cited reference. Applicants herein limit the through holes in claim 1 to 11-100 μm, which is larger than 10 μm. Applicants submit that the cited Takauchi et al. specifically teaches that the through holes should be smaller than 10 μm. Therefore, Applicants submit that at least this limitation is not taught by the cited reference.

Applicants also note that the pores of Takauchi et al. are necessarily straight. Instead, the pores of Takeuchi et al. are shaped in a curved fashion, so that each pore has at least several changes of direction on its way through the membrane. Claim 2 describes the through holes as having a substantially straight line shape. Applicants submit that the cited reference does not

teach the combination of the claimed size and shape of the through holes. However, Applicants note that the Examiner is using a creative interpretation of the "substantially straight line shape" limitation, implying that a curved passage is straight, if in a sufficiently small segment.

Therefore, Applicants herein amend claim 2 to more particularly claim the invention, by adding the limitation that "the through holes have an substantially straight-line shape **extending completely through the separator**".

With respect to the rejection of claim 17, Applicants not that claim 1, from which claim 17 depends, is novel and non-obvious over Takauchi et al. Therefore, it would not have been obvious to one of ordinary skill in the art to reach claim 17 from any combination of Takauchi et al. and Eschbach et al. The same would apply to claims 25 and 32, which are respectively dependent from novel and non-obvious claims 21 and 26 over Takauchi et al.

New Claims

Applicants also submit new claims 21-32 that are not limited to the size range of claim 1, but rather define the shape of the through holes as in claim 2.

New claim 21 reads as follows:

"A nonaqueous electrolyte secondary cell comprising a positive electrode, a negative electrode, a nonaqueous electrolyte, a separator interposed between the positive electrode and the negative electrode, the positive electrode and the negative electrode, the positive electrode having a positive electrode active material comprising a chemical compound capable of reversibly intercalating lithium and the negative electrode having a negative electrode active material comprising a material capable of reversibly intercalating lithium, wherein the separator has through holes for passing lithium dendrites therethrough:

wherein the through holes have a diameter of 5 μm to 100 μm; and

wherein the through holes have a substantially straight line-shape extending completely through the separator and the positive electrode and the negative electrode are connected thereby."

This new independent claim 21 is a combination of the original claims 1, 2, 4 and 7 and does not constitute an addition of new matter.

Applicants note that Takauchi et al. discloses fine pores that are shaped in a curved fashion, as shown in Figs. 1 and 2, but does not disclose or suggest straight pores.

Takauchi et al. in col. 5, lines 55-60, teaches that "when temperature rises above normal operating temperatures to indicate abnormal conditions and thereby exceed the melting point of the second polymer, the second polymer becomes a fluid sealing off the fine pores, and thus the migration of ions through the fine pores is blocked as shown in Fig. 1-(b)."

This description shows that the fine pores of Takauchi et al. are for the purpose of cutting off current when cell temperature rises abnormally and the fine pores are sealed off.

On the other hand, the separator of claim 21 of the present application has straight through holes. The through holes are straight because "...lithium dendrites can smoothly grow and thereby electrical contact between the positive electrode and the negative electrode is formed at an earlier stage of lithium dendrite formation. Thus, safety of a cell is further improved." (See page 4, lines 14-19 in the specification).

That is, the through holes of claim 21 are for the purpose of encouraging a current flow between the positive electrode and the negative electrode.

Further, the specification of the present application, page 4, lines 14-19, says that "[w]hen the through holes have a substantially straight line-shape and the positive electrode and

the negative electrode are connected thereby, lithium dendrites can smoothly grow and thereby electrical contact between the positive electrode and the negative electrode is formed at an earlier stage of lithium dendrite formation. Thus, safety of the cell is further improved."

On the other hand, Takauchi et al., col. 24-26, describe "when the average pore size is greater than 10 μm, the possibility of short circuit due to the formation of dendrites rapidly increases."

From these descriptions, it is considered that the fine pores of Takauchi et al. are curved, in which case lithium dendrites grow smoothly.

Thus, the through holes of the present application differ in shape and function from the fine pores of Takauchi et al., and therefore the present invention is neither taught nor suggested by the cited reference. The same would apply to claims 22-25, which are dependent from claim 21.

New independent claim 26 is a combination of the original claims 1, 4 and 7 and graph 9 and Fig. 12, and does not constitute an addition of new matter.

Takauchi et al., col. 9, lines 51-56, disclose a porosity of 30-80%.

In claim 26 of the present application, the through holes, for passing lithium dendrites therethrough and with a diameter of 5 μm to 100 μm, are provided at a density of one through hole to four through holes per square centimeter.

When the through holes have a maximum diameter of 100 μm and are provided at a maximum density of four through holes per square centimeter, then the hole area is $(0.01\ (cm) \div 2)^2 \times \pi \times 4 \cong 0.000314\ cm^2$, i.e., the through holes constitute a porosity of approximately 0.0314%. Therefore, the porosity the through holes constitute is outside the range disclosed and suggested by Takauchi et al.

Thus, claim 26 of the present application should be novel and nonobvious over Takauchi et al. The same would apply to claims 27-32, which are dependent from claim 26.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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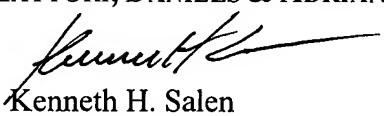

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